



Casting Machine Operator

QP Code: G&J/Q2801

Version: 1.0

NSQF Level: 4

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G&J/Q2801: Casting Machine Operator

Brief Job Description

The individual at work converts wax models to jewellery pieces through investment casting process. The individual invests the flask and then operates semi to fully-automated machines to pour and regulate the flow of molten precious metal into cavities created by melted wax, to produce cast jewellery pieces on mass scale.

Personal Attributes

The job requires the individual to have: attention to details, physical strength to handle heavy equipment, ability to multi-task in a process driven team and work in a high temperature environment for long hours. A caster is expected to have integrity in dealing with high value jewellery

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [G&J/N2801: Operate casting machine](#)
2. [G&J/N9901: Respect and maintain IPR](#)
3. [G&J/N9902: Interact with colleagues and seniors](#)
4. [G&J/N9905: Maintain occupational health and safety](#)

Qualification Pack (QP) Parameters

Sector	Gem & Jewellery
Sub-Sector	Cast and diamonds-set jewellery
Occupation	Casting
Country	India
NSQF Level	4
Credits	NA
Aligned to NCO/ISCO/ISIC Code	NCO-2004/Nil
Minimum Educational Qualification & Experience	Ability to read and write

Minimum Level of Education for Training in School	
Pre-Requisite License or Training	NA
Minimum Job Entry Age	18 Years
Last Reviewed On	15/07/2015
Next Review Date	31/03/2022
Deactivation Date	09/02/2023
NSQC Approval Date	05/08/2015
Version	1.0
Reference code on NQR	2015/GJ/GJSCI/01158
NQR Version	1.0

G&J/N2801: Operate casting machine

Description

This unit is about converting wax models to jewellery pieces through investment casting process. This process includes production cycle planning and precisely controlling machine parameters in order to manufacture jewellery with minimal rework. Investment casting is the most critical step in cast and diamond-set jewellery manufacturing.

Scope

This unit/task covers the following: Collect wax tree and alloys from supervisor and consumables from stores

- collect wax trees and inspect for any imperfections in the wax tree such as loosely soldered wax pieces on central stem
- plan the casting cycle in consultation with production manager
- calculate and weigh the required amount of alloy (precious metal) required as per wax tree and job sheet Melt the alloys
- add the alloys in a melting machine
- set the temperature as per machine specifications mentioned for the alloy
- stir the molten alloy and remove after specified time
- solidify and cool the alloy in water
- collect carbon particles and dust separately Invest a flask
- prepare slurry from specified amount of Plaster of Paris (PoP), boric acid and demineralised (DM) water
- Place the wax tree in the flask
- Pour the slurry over wax tree in the flask and leave it for drying at room temperature as per operating procedure
- remove the rubber base from the bottom of flask and prepare the flask for burnout cycle Execute burnout cycle on flask to melt wax tree
- set the furnace cycle as per industry specifications
- place the flask in the furnace for 12-16 hours, depending on the furnace temperature specifications
- set the temperature and time of furnace according to its operating parameters
- bring out the flask and leave it at room temperature for cooling Melt and cast the precious metal alloy
- set casting machine parameters as per machine's operating specifications such as temperature and duration of casting
- place the flask out from burnout cycle, in the casting machine
- add precious metal alloy in the crucible of casting machine
- pour the metal alloy - for manual operations or wait for metal alloy to be poured automatically - once the required temperature is reached
- remove the flask and leave it for cooling at the room temperature

Elements and Performance Criteria

Melting the alloys

To be competent, the user/individual on the job must be able to:

- PC1.** accurately compute alloy required as per wax tree weight
- PC2.** proportionately use re-cycled and new gold in the alloy making
- PC3.** ensure minimal accidents while handling molten metal

Investment

To be competent, the user/individual on the job must be able to:

- PC4.** mix of all the required materials such as PoP, boric acid and DM water for investment process as per industry standards
- PC5.** prepare bubble-free investment of flask

Running burnout cycle

To be competent, the user/individual on the job must be able to:

- PC6.** constantly monitor furnace temperature for complete burnout cycle duration so that an incomplete process does not lead to casting defects

Casting

To be competent, the user/individual on the job must be able to:

- PC7.** set machine parameters as per machine specifications prescribed for a particular alloy
- PC8.** Pour metal at the right temperature in manual pouring mode

Productivity

To be competent, the user/individual on the job must be able to:

- PC9.** properly plan casting cycles for the optimum utilisation of machines
- PC10.** minimise rework and precious metal loss in the casting process
- PC11.** timely deliver casted jewellery pieces to next process
- PC12.** produce number of casted jewellery pieces or precious metal tree as per target deliverable and quality approved by the supervisor

Quality of output

To be competent, the user/individual on the job must be able to:

- PC13.** produce defect-free casted jewellery pieces
- PC14.** ensure minimum damage to the set stones during casting process
- PC15.** produce Quality Control okayed cast jewellery piece

Resolving problems

To be competent, the user/individual on the job must be able to:

- PC16.** deliver casted jewellery pieces on time by reporting problems faced or anticipated well in advanced

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** companys policies on: acceptable limits of gold and other precious metal loss, quality, incentives, delivery standards, safety and hazards, integrity and IPR, personnel management and dress code
- KU2.** importance of the individuals role in the workflow
- KU3.** reporting structure
- KU4.** metallurgy (gold alloy properties including malleability)

- KU5.** methods of calculating required quantities of alloys
- KU6.** production process planning
- KU7.** uses of different types of tools, consumables and machines in jewellery casting process
- KU8.** potential work hazards while handling molten metal

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read notes, designs and instructions on job sheet
- GS2.** read company rules and compliance documents required to complete the work
- GS3.** calculate and weigh the correct amount of alloy required as per wax tree and job sheet
- GS4.** assess gold loss during the casting process so as to deliver jewellery pieces of required weight
- GS5.** share work load as required
- GS6.** receive feedback from co-workers and supervisor
- GS7.** share knowledge with co-workers and supervisor
- GS8.** use of following key tools, machines and consumables for casting process: Investment flasks
Measuring cylinder Carbon stirring rod Plaster of Paris (PoP) PoP particulate filters Slurry
mixing equipment Metal Melter Casting machine Kilns Burnout ovens/furnace Water jet spray
gripper
- GS9.** work in a safe environment, i.e., without injuries
- GS10.** organise tools and documents required for the job
- GS11.** plan the casting batches for optimum utilisation of the casting machine
- GS12.** give design inputs, for example, the number and size of sprue added to master model, for
required flow of molten metal
- GS13.** improve work processes
- GS14.** reduce precious metal loss
- GS15.** effectively use the casting processes to improve the quality and productivity of the jewellery
piece
- GS16.** anticipate process disruption and reasons for delay

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Melting the alloys</i>	3	10	-	-
PC1. accurately compute alloy required as per wax tree weight	1	2	-	-
PC2. proportionately use re-cycled and new gold in the alloy making	1	5	-	-
PC3. ensure minimal accidents while handling molten metal	1	3	-	-
<i>Investment</i>	4	15	-	-
PC4. mix of all the required materials such as PoP, boric acid and DM water for investment process as per industry standards	2	10	-	-
PC5. prepare bubble-free investment of flask	2	5	-	-
<i>Running burnout cycle</i>	3	10	-	-
PC6. constantly monitor furnace temperature for complete burnout cycle duration so that an incomplete process does not lead to casting defects	3	10	-	-
<i>Casting</i>	4	13	-	-
PC7. set machine parameters as per machine specifications prescribed for a particular alloy	2	10	-	-
PC8. Pour metal at the right temperature in manual pouring mode	2	3	-	-
<i>Productivity</i>	1	9	-	-
PC9. properly plan casting cycles for the optimum utilisation of machines	1	3	-	-
PC10. minimise rework and precious metal loss in the casting process	-	2	-	-
PC11. timely deliver casted jewellery pieces to next process	-	2	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC12. produce number of casted jewellery pieces or precious metal tree as per target deliverable and quality approved by the supervisor	-	2	-	-
<i>Quality of output</i>	-	6	-	-
PC13. produce defect-free casted jewellery pieces	-	2	-	-
PC14. ensure minimum damage to the set stones during casting process	-	2	-	-
PC15. produce Quality Control okayed cast jewellery piece	-	2	-	-
<i>Resolving problems</i>	-	2	-	-
PC16. deliver casted jewellery pieces on time by reporting problems faced or anticipated well in advanced	-	2	-	-
NOS Total	15	65	-	-

National Occupational Standards (NOS) Parameters

NOS Code	G&J/N2801
NOS Name	Operate casting machine
Sector	Gem & Jewellery
Sub-Sector	Cast and diamonds-set jewellery
Occupation	Casting
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	15/06/2015
Next Review Date	31/03/2022
NSQC Clearance Date	NA

G&J/N9901: Respect and maintain IPR

Description

This OS unit is about protecting companys IPR and avoiding infringement to IPR of other companies

Elements and Performance Criteria

Respecting and maintaining IPR

To be competent, the user/individual on the job must be able to:

- PC1.** be able to spot plagiarism and report
- PC2.** be aware of patents and ipr
- PC3.** not be involved in ipr violations

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** companys policies on ipr and plagiarism
- KU2.** reporting structure
- KU3.** companys unique product range
- KU4.** patents and ipr laws
- KU5.** how ipr protection is important for competitiveness of a company

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** effectively communicate any observed ipr violations or order leaks
- GS2.** report potential sources of violations
- GS3.** learn from past mistakes and report ipr violations on time
- GS4.** learn from past mistakes and report ipr violations on time

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Respecting and maintaining IPR</i>	4	5	-	-
PC1. be able to spot plagiarism and report	2	1	-	-
PC2. be aware of patents and ipr	1	3	-	-
PC3. not be involved in ipr violations	1	1	-	-
NOS Total	4	5	-	-

National Occupational Standards (NOS) Parameters

NOS Code	G&J/N9901
NOS Name	Respect and maintain IPR
Sector	Gem & Jewellery
Sub-Sector	Jewellery Retail, Cast and diamonds-set jewellery
Occupation	Designing and Product Development
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	15/06/2015
Next Review Date	24/02/2025
NSQC Clearance Date	24/02/2022

G&J/N9902: Interact with colleagues and seniors

Description

This OS unit is about communicating with colleagues and seniors in order to achieve smooth and hazard-free work flow

Elements and Performance Criteria

Interaction with supervisor

To be competent, the user/individual on the job must be able to:

- PC1.** understand the work output requirements
- PC2.** comply with company policy and rule
- PC3.** deliver quality work on time as required by reporting any anticipated reasons for delays

Interactions with colleagues and other departments

To be competent, the user/individual on the job must be able to:

- PC4.** put team over individual goals
- PC5.** be able to resolve conflicts
- PC6.** learn how to multi-task relevant activities

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** companys policies on: preferred language of communication, reporting and escalation policy, quality delivery standards, and personnel management
- KU2.** reporting structure
- KU3.** communicate effectively
- KU4.** build team coordination

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** read and write preferred language of communication as prescribed by the company
- GS2.** read job sheets and interpret technical details mentioned in the job sheet
- GS3.** how to spot and communicate potential areas of disruptions to work process and report the same
- GS4.** when to report to supervisor and when to deal with a colleague individually, depending on the type of concern
- GS5.** improve work processes by interacting with others and adopting best practices
- GS6.** spot process disruptions and delays and report and communicate with solutions

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Interaction with supervisor</i>	1	3	-	-
PC1. understand the work output requirements	1	1	-	-
PC2. comply with company policy and rule	-	1	-	-
PC3. deliver quality work on time as required by reporting any anticipated reasons for delays	-	1	-	-
<i>Interactions with colleagues and other departments</i>	2	2	-	-
PC4. put team over individual goals	1	-	-	-
PC5. be able to resolve conflicts	-	1	-	-
PC6. learn how to multi-task relevant activities	1	1	-	-
NOS Total	3	5	-	-

National Occupational Standards (NOS) Parameters

NOS Code	G&J/N9902
NOS Name	Interact with colleagues and seniors
Sector	Gem & Jewellery
Sub-Sector	Jewellery Retail, Cast and diamonds-set jewellery
Occupation	Designing and Product Development
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	15/07/2015
Next Review Date	24/02/2025
NSQC Clearance Date	24/02/2022

G&J/N9905: Maintain occupational health and safety

Description

This OS unit is about being aware of, communicating and taking steps towards minimizing potential hazards and dangers of accidents on the job and maintaining occupational health and safety

Elements and Performance Criteria

Communicating potential accident points

To be competent, the user/individual on the job must be able to:

- PC1.** spot and report potential hazards on time
- PC2.** follow company policy and rules regarding use of hazardous materials
- PC3.** attend and actively participate in the health and safety campaigns organised by the company

Using safety gear

To be competent, the user/individual on the job must be able to:

- PC4.** use or wear safety gear as per the rules of the company

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** companys policies on handling: harmful chemicals and sharp tools, safety and hazards of machines, fire safety and, disposal of harmful chemicals and materials
- KU2.** work flow involved in companys jewellery manufacturing process
- KU3.** importance of the individuals role in the workflow
- KU4.** reporting structure
- KU5.** how different chemicals react and what could be the danger from them
- KU6.** how to use machines and tools without causing bodily harm
- KU7.** fire safety education
- KU8.** first aid execution
- KU9.** disposal of hazardous chemicals, tools and materials by following prescribed environmental norms or as per company policy
- KU10.** companys policies on: safety and hazardsand personnel management
- KU11.** reporting structure
- KU12.** how to use machines and tools without suffering bodily harm

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** prepare notes, task lists and schedule with co-workers
- GS2.** prepare progress reports

- GS3.** read notes and put notes on design
- GS4.** read company rules and compliance documents required to complete the work
- GS5.** discuss task lists, schedules and work-loads with co-workers
- GS6.** question co-workers appropriately in order to understand the nature of problem and to make a diagnosis
- GS7.** keep seniors informed about the progress of work
- GS8.** make decisions pertaining to the concerned area of work to implement them on personal or organizational level
- GS9.** plan and organize the work to meet health, safety and security requirements
- GS10.** use customer centric approach that provides a positive customer experience before and after the sale in order to drive repeat business, customer loyalty and profits
- GS11.** think through the problem, evaluate the possible solution (s) and suggest an optimum/ best possible solution (s)
- GS12.** identify immediate or temporary solutions to resolve delays
- GS13.** analyze activities by breaking them down into single and manageable components
- GS14.** anticipate process disruption and reasons for delay
- GS15.** effectively communicate the danger
- GS16.** keep all the tools in an organised manner so as to avoid accidents
- GS17.** keep the work environment safe and clean
- GS18.** report potential sources of danger
- GS19.** follow prescribed procedure in the event of an accident
- GS20.** wear appropriate safety gear to avoid an accident
- GS21.** learn from past mistakes regarding use of hazardous machines or chemicals
- GS22.** spot danger
- GS23.** report potential sources of danger
- GS24.** follow prescribed procedure in the event of an accident
- GS25.** wear appropriate safety gear to avoid an accident

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Communicating potential accident points</i>	2	4	-	-
PC1. spot and report potential hazards on time	1	1	-	-
PC2. follow company policy and rules regarding use of hazardous materials	-	2	-	-
PC3. attend and actively participate in the health and safety campaigns organised by the company	1	1	-	-
<i>Using safety gear</i>	1	1	-	-
PC4. use or wear safety gear as per the rules of the company	1	1	-	-
NOS Total	3	5	-	-

National Occupational Standards (NOS) Parameters

NOS Code	G&J/N9905
NOS Name	Maintain occupational health and safety
Sector	Gem & Jewellery
Sub-Sector	Imitation Jewellery, Cast and diamonds-set jewellery
Occupation	Designing and Product Development
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	27/05/2021
Next Review Date	27/05/2024
NSQC Clearance Date	27/05/2021

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/ Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each Element/ PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Minimum Aggregate Passing % at QP Level : 70

(**Please note:** Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
G&J/N2801. Operate casting machine	15	65	-	-	80	70
G&J/N9901. Respect and maintain IPR	4	5	-	-	9	10
G&J/N9902. Interact with colleagues and seniors	3	5	-	-	8	10
G&J/N9905. Maintain occupational health and safety	3	5	-	-	8	10
Total	25	80	-	-	105	100

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.

<p>Organisational Context</p>	<p>Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.</p>
<p>Technical Knowledge</p>	<p>Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.</p>
<p>Core Skills/ Generic Skills (GS)</p>	<p>Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.</p>
<p>Electives</p>	<p>Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.</p>
<p>Options</p>	<p>Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.</p>